Curriculum Renewal and Examination Reform: a Case Study from Malaysia

Keith Lewin

This paper is concerned with inter-relationships between qualitative improvements in curricula and patterns of public examination. Through consideration of a particular example—the development and implementation of the Malaysian Integrated Science course (MIS)—it argues the case for:

1 developing techniques of assessment and examination which correspond systematically with the educational objectives of new curricula;

2 close monitoring of the workings of selection examinations and their effects on the curriculum;

3 detailed and substantive feedback of examination performance to teachers and pupils.

Though the data on which this article is based derive from fieldwork in Malaysia, many of the problems highlighted have their parallels in other countries. I leave it to the reader to decide whether differences in contexts they are familiar with are sufficiently significant to warrant modifying my conclusions.

The Malaysian Integrated Science Course

Like many other science courses in the Asian region introduced in the late 1960s and early 1970s, MIS is modelled fairly closely on materials and methods designed initially for the schools of a developed country. Scottish Integrated Science provided the model for MIS and, though some adaptation took place, the bulk of the course material and recommended teaching strategies remained unchanged. Indeed, MIS materials refer teachers to the Scottish Integrated Science publications for further advice and guidance.

The MIS programme was first introduced in Malaysia in 1969 and by 1975 was being taught in almost all lower secondary schools (grades 7–9) as the standard programme. The course is based on a series of worksheets for pupils to use in carrying out classroom activities, which are supplemented by help from teachers. Pupil textbooks have been widely available since 1973. These follow closely the pattern of the worksheets but include additional information and explanation.

The general approach to science education promoted by this course can best be indicated through some exemplary quotes taken from material recommended to Malaysian teachers:

> *It is suggested that the 'didactic' method should be minimised and the 'heuristic' method utilised wherever possible.* [MIS 1973]

> *In order to achieve the objectives it is essential that discovery methods should be used, involving pupils in carrying out as much practical work as possible. They must be active participators, not passive receptors.* [Mee et al 1971]

> *The very process of discovering appears to us to be as important as the knowledge discovered.* [Scottish Education Dept 1969]

> *Pupils [should be provided] with examples of scientific methods so that with sufficient practice they may eventually use them in new situations without the support of imposed worksheets.* [Scottish Education Dept 1969]

Course aims[1] include nine in the cognitive domain (intellectual skills) of which two relate to the acquisition of knowledge, two to communication skills and five to comprehension, application, analysis and higher level behaviours. In addition six affective aims (attitudinal) are specified along with two which are primarily concerned with psychomotor skills (physical coordination and manipulation).

In intention, the programme's emphasis is clear. Science is not to be approached as a repository of factual information to be memorised but through an exploration of the world of experience. Active involvement of pupils in identifying, observing and analysing phenomena is central to the teaching strategy and pupils are expected to develop intellectual skills associated with problem solving, hypothesising, experimental design and interpreting results. Attitudinal outcomes are to be given considerable emphasis (eg interest and enjoyment in scientific activities, awareness of social and economic implications of scientific activity).

[1] These are stated in the Syllabus document. [MIS 1973]

MIS and Public Examinations

The public examination associated with the MIS course is known as the LCE/SRP.[2] It is a selective examination: performance in it decides whether pupils will be offered a place to proceed to grades 10 and 11 and take the MCE/SPM[3] (approximately equivalent to 'O' level in the English system). For Integrated Science this examination takes the form of a 75 item, multiple choice, objectively scored paper with five possible responses to each question. Though this was introduced as a new examination relating specifically to MIS, its form paralleled previous practice. Objective, multiple choice papers were introduced for most subjects after 1967, including science. Question content was modified to reflect new teaching material in MIS.

Original Scottish materials emphasise that

> *any examinations set should be such that this syllabus is taught as it ought to be; tests should be constructed to examine practical techniques, design of experiments and ability to solve problem situations either by experimentation or by describing the experiment in words. When written answers are required they should not be long essays about remembered details; instead, questions of the multiple choice and one word answer type should be used.*
> [Scottish Education Dept 1969]

Malaysian materials endorse this and further stress that 'testing should be done only to assess whether the stated objectives have been achieved' [MIS 1973].

Table 1

Classification of items in the LCE/SRP Integrated Science 1972–75[1]

classification	*no*	% *1972*	*no*	% *1973*	*no*	% *1974*	*no*	% *1975*
Knowledge	46	61	45	60	38	51	38	51
Comprehension	23	31	23	31	25	33	24	32
Application and Higher	6	8	7	9	12	16	13	17
Affective	0	0	0	0	0	0	0	0

[1] This overall classification was the result of combining the classificatory judgements of four independent, experienced educationists familiar with the course.

Analysis of examination papers between 1972 and 1975 provides some insight into the extent to which behaviours actually tested reflect the intended emphases of the MIS programme. The classification system used is that of Bloom [1971], referred to in course materials.

Over half the items used were classified as testing achievement at the knowledge level (ie they were questions answerable from recall of information alone). Though some items are related to experiments performed by pupils there is no provision for any practical examination. Few questions used required the application of knowledge and none was directed towards measuring affective outcomes. Given the intended stress in the programme on higher cognitive and attitudinal outcomes and the deliberate playing down of the importance of factual information, the distribution of item types appears anachronistic.

It is relatively easy to explain why the format chosen for the LCE/SRP Integrated Science was an objective multiple choice examination. Other subjects had adapted this pattern of testing in Malaysia and original Scottish materials appeared to advocate it [Scottish Education Dept 1969] (though Scottish Integrated Science was not designed to lead to a public examination). In addition, the Malaysian Examinations Syndicate's need to measure the achievement of large numbers of pupils for selection purposes weighed heavily in favour of examining methods that would allow large scale mechanisation of the processing of scripts. A practical examination was never considered a possibility because of its costs and administrative problems.

It is more difficult to explain why the papers designed did not more closely reflect the intentions of course designers and stress non-recall based achievement. In some respects, eg in experimental design, problem solving techniques, application of scientific knowledge, there seem no compelling reasons for the lack of emphasis on related questions in the public examination. In

2 Lower Certificate of Education/Sijil Rendah Pelajaran—the English medium qualification has been phased out since this study was undertaken.
3 Malaysian Certificate of Education/Sijil Pelajaran Malaysia.

other respects, eg in relation to affective outcomes, it is more plausible that problems related to the construction of appropriate questions can provide an explanation.

Part of the conventional wisdom amongst some Malaysian examiners with whom the course was discussed appeared to be that knowledge level items were easier to construct and validate than those measuring higher level cognitive skills. This is not a sufficient reason to justify disproportionate emphasis on the former. Items designed to operate above the knowledge level **may** be more difficult for examinees, but not necessarily so—facility values (ie proportion of candidates producing correct responses) for the 1975 LCE/SRP items clearly show this.

Table 2

Analysis of 1975 LCE/SRP

item classification	*mean facility*	*range of facility values*
Knowledge	0.503	0.18–0.74
Comprehension	0.487	0.29–0.86
Application and higher	0.429	0.24–0.61

The most difficult question, with only 18 per cent achieving a correct response, was a knowledge item [see also Little 1978].

Common practice within the Malaysian examination syndicate is to involve groups of teachers and curriculum specialists in the design and development of question papers within guidelines provided by 'Tables of Specifications'. Guidelines relating to MIS specify that approximately 40 per cent of items (30/75) should be constructed to test knowledge. This figure seems to have been constantly exceeded. Conservatism on the part of teacher members of question setting teams may be partly responsible (if the majority of them adhere to a view of science education as primarily the acquisition of factual information). Pressure on time and limited expertise may also be factors inhibiting a more balanced development of papers that more accurately reflect the learning emphases of MIS. The fact that examination papers were not routinely available to curriculum workers as late as 1975 suggests that communication between them and examination setters was not as effective as it might have been. Some genuine misunderstandings may have contributed to the apparent mismatch between curricula intentions and their formal assessment.

Some Effects of Public Examinations on MIS

The precise causes of continued emphasis in public examination papers on the recall of information, despite explicit changes in the rationale behind the course to which they relate, are not easy to unravel. What is perhaps clearer is the consequences of such an emphasis on the MIS curriculum in action. The LCE/SRP is crucial in the allocation of life chances for Malaysian pupils; it is the first selection point in the education system which limits progression to the next level. Pupils who fail the LCE/SRP are unlikely subsequently to obtain wage or salary employment and will almost certainly find occupational niches in the 'traditional' sector of the economy.

Understandably the pupils' anxiety about passing the LCE/SRP is high—over 60 per cent of a sample of approximately 2,000 grade 8 and 9 pupils expressed worry about failing the LCE/SRP; about 75 per cent indicated that they would try and resit if they did fail; 75 per cent claimed that they practised objective tests in order to improve their examination performance and nearly 40 per cent indicated that the main reason they studied science was to pass the LCE/SRP.[4] These observations, coupled with a recognition that it is easily possible to pass LCE/SRP science on the basis of the recall of information alone,[5] suggest that the pattern of examining is likely to have adverse effects on teaching and learning related to MIS.

In the research on which this article is based, teachers of MIS from 54 schools in the West Malaysian states of Selangor and Kelantan were asked to comment in a free response questionnaire on the form and effects of the LCE/SRP examination. The number of teachers responding to this invitation was 105, and the main remarks made are summarised below. Bracketed figures refer to actual numbers of teachers making substantively similar remarks; where these numbers were small such remarks have been omitted from this table.

4 Figures here relate to responses to a pupil questionnaire used with a representative sample of 2,076 pupils drawn almost entirely from grades 8 and 9 in schools distributed throughout the West Malaysian states of Selangor and Kelantan. The response rate for the questionnaire was over 86 per cent.

5 Historically, pass marks in science fluctuate around 30/75. With over half the questions answerable from recall alone, it is relatively easy to pass without answering other types of questions successfully. More evidence of the widespread perception that LCE/SRP examinations primarily test recall ability, is provided later in this paper.

Table 3

Free response remarks made by teachers relating to the LCE/SRP examination

Summary comments	*% of total comments*
Expression/understanding	21
i) Objective questions inhibit expressive ability	(10)
ii) Pupils can do well with little understanding	(10)
Motivation	29
i) Pupils are only interest in studying for the examination	(11)
ii) Pupils need only recognise answers and concentrate on memorisation	(7)
iii) Pupils rely on practising objective tests for revision	(6)
iv) Pupils guess objective tests and do not study for them	(4)
Effects on teachers	14
i) Teachers concentrate on facts and discard discovery methods	(10)
Nature of examination questions	30
i) Few questions relate to practical work and it is therefore undervalued	(10)
ii) Concentration on factual knowledge restricts teaching and learning	(7)
iii) Other forms of questions apart from multiple choice should be used	(5)
General	6
i) Examination system is satisfactory	(4)

Few teachers responding had positive remarks to make concerning the effects of the LCE/SRP on the teaching of MIS. Teachers might reasonably be expected to voice dissatisfaction rather than satisfaction in response to an open question, since those who are dissatisfied may feel more motivated to write comments. That only four teachers did indicate general satisfaction does suggest that there is widespread and genuine concern with the adverse effects of the LCE/SRP.

Information from semi-structured interviews with 43 teachers in 15 of the 54 schools followed a similar pattern to the questionnaire responses. Objective tests were the subject of much criticism, the most common assertions being that they discouraged the development of powers of expression and language fluency (six responses); discouraged understanding by rewarding powers of recognition and recall (three responses); increased the bad effects of examination orientation since weaker students especially perceived performance to be related closely to practice and memory (seven responses). Several teachers referred to a common belief amongst pupils that objective tests were 'easier' than other types and therefore required less work and more luck in their completion. This, they asserted, had adverse motivational results particularly amongst the less able. Some (three) teachers went as far as to suggest that considerable proportions of students relied heavily on books of objective test questions for examination practice and neglected the course itself almost entirely.

A few teachers stated that they had had no training in writing multiple choice items and were therefore forced to rely on books of questions as a source for their own internal tests. Most teachers who commented on writing tests did this as a matter of convenience in any case. One teacher pointed out that time constraints and workload compelled him to use objective tests, though he did not think they were the best instruments available. Those teachers who attempted to justify their use of objective items did so by citing the format of the LCE/SRP examination and the course recommendations.

Though two teachers expressed the opinion that practical work was useful indirectly in enhancing LCE/SRP performance through helping students remember facts and processes, a larger number (six) said explicitly that they felt practicals had little effect on examination results in the present LCE/SRP. About a quarter of the teachers interviewed referred **unprompted** to examination orientation dominating teaching in their schools saying for example that 'teachers only teach for examinations'; 'the headmaster, parents and pupils are only interested in examination results'; 'good teachers are those who give good notes for examination revision'. One teacher pithily observed: 'the purpose of the Integrated Science course is to develop the ability to observe and reason, the purpose of the school is to get as many examination passes as possible'.

Another way in which the format adopted for the LCE/SRP seems to have influenced classroom teaching is in relation to methods of internal school assessment. Despite the largely unfavourable perception of the educational consequences of restricting assessment to the use of objective multiple choice tests, this is in fact what the bulk of teachers do according to their questionnaire responses and interview data.

Table 4

Test types by frequency of use (%)[1]

type	*frequency of use*				
	not used	*less than ¼ of tests*	*¼ – ½ of tests*	*½ – ¾ of tests*	*¾ – all tests*
Structured	18	35	35	9	2
Short answer	30	31	25	10	4
Essay	58	32	5	3	2
Multiple choice	10	7	12	22	49
Practical	66	27	5	1	1

[1] Total number of teachers responding = 242, total number of teachers in sample 291, response rate = 83%

Significantly, very few utilise forms of practical testing though this is the only kind explicitly recommended in addition to multiple choice objective questions in Malaysian course materials. Moreover, other questionnaire data indicate that the majority of teachers rely on published books of multiple choice items (usually derived from previous LCE/SRP question papers) in constructing their tests and that most use questions to test knowledge of scientific facts and principles rather than their application. Teachers' opinions of the purposes served by internal testing give overall priority to measuring the achievement of pupils (52 per cent ranked this first) and providing a motivation for pupils to study (21 per cent ranked this first). Only 17 per cent ranked measuring how effective their teaching had been as a primary purpose though this seems to be the recommendation in course materials [MIS 1973, Scottish Education Dept 1969].

Pupils' attitudes to learning do seem strongly influenced by the LCE/SRP examination. In addition to the levels of concern with success, the numbers of pupils practising objective tests and the large numbers asserting that they only studied science to pass the LCE/SRP noted above, it is clear that pupils perceive multiple choice objective questions as easier than essay questions that involve expression. They also see such questions as being primarily dependent on recall for their successful completion. Two questionnaire responses from the pupil survey cited above indicate this.

Moreover, 'having a good memory' and 'practising examination questions' were ranked third and fourth in importance by pupils as factors contributing to performance on science examinations ('working hard' and 'having good teachers' were ranked first and second). Pupils attached more importance to memory and examination practice than did teachers. Such stress on the value of memorisation does appear to contradict the intention of the MIS course to provide a 'much reduced emphasis on the retention of the factual content of the syllabus'.

Table 5

Pupil response to survey questions

question:
I like objective questions because they are easier to answer than essay questions:

	no	%	%
strongly agree	755	36.4	72·2
agree	744	35.8	
undecided	316	15.2	15.2
disagree	153	7.4	11·5
strongly disagree	86	4.1	
omissions	22	1.0	1.0
	2,076	99.9	99.9

question:
To do well on objective questions all you need is a good memory:

	no	%	%
strongly agree	497	23.9	57·0
agree	687	33.1	
undecided	369	17.8	17.8
disagree	376	18.1	24·1
strongly disagree	125	6.0	
omissions	22	1.0	1.0
	2,076	99.9	99.9

A large majority of pupils apparently do feel that 'there are too many facts to remember in Integrated Science'—about 62 per cent of the sample agreed with this statement. Moreover it is disproportionately the less able who feel this. (Of those getting the top three LCE/SRP grades, 40 per cent agreed with this, and over 70 per cent of those getting the bottom three grades. The

question was asked before the examination was taken.) Thus the perception is strong amongst pupils that science education is concerned very much with the acquisition of factual information.

Data from the observation of 40 normal class periods in 15 of the schools in the sample provides some additional insight into ways in which the LCE/SRP may affect the teaching of the course. An observation schedule was used to record the frequency with which various types of activity took place, with the following results.

Table 6

Classroom interactions by percentage time spent

	%
1. Settling the class/Administration	4·5
2. General class discussion	32·2
3. Group-teacher discussion	8·3
4. Individual-teacher discussion	0·9
5. Teacher draws/writes/reads	7·0
6. Pupils draw/write	2·9
7. Pupils use text/reference books	2·1
8. Pupils use worksheets reading/writing	16·6
9. Teacher explains experimental procedure	5·6
10. Teacher demonstrates experiment	4·2
11. Class experiments	15·7

That is, less than 16 per cent of class time was spent with pupils actually undertaking experimentation as the main activity. Most class time—over 32 per cent—was spent with the teacher addressing the class as a whole. These interactions were further analysed into categories of discussion types, with the following percentage distribution:

Introduce facts/principles	21
Recall facts/principles	35
Apply facts/principles	6
Hypothesise	1
Observe	28
Interpret data	7
Infer from data	1

Thus considerable time was spent in class discussions introducing new information and concepts, and the greatest single number of observations occurred when teachers were requiring pupils to recall such information and/or principles. Further analysis of other observation data indicated that the 'guided discovery' approach recommended in course materials was used by very few teachers. For example, on no occasion were pupils observed contributing to the design of experiments and they were rarely asked to hypothesise, predict, interpret or infer.

The observed pattern of teaching described very briefly here is not inconsistent with an interpretation which holds that the lack of emphasis on practical work and related skills is at least partly attributable to patterns of examining. Insofar as these encourage the acquisition of factual knowledge, they inhibit teachers from devoting more time to experimentation and the use of 'guided discovery' methods. Interestingly, one teacher did refer directly to examinations in an observed lesson, indicating that, at least for her, this provided a powerful source of motivation for her pupils and influenced her teaching, even though the examination was four months away. The remarks she made included the following:

> *Come, you are going to sit for the examination.* (The teacher was trying to get the attention of the class at the beginning of the lesson.)
>
> *I am fed up with you people, many of you do not work and deserve to fail. Be quiet and try to pass your LCE. Do not disturb us.* (A large group of boys were misbehaving.)
>
> *Do you think you can guess the answers* [in the LCE]*? If only A and B you could, but with five* [alternatives]*—ABCDE—you cannot.*

Other explanations of the observed patterns of teaching described are of course possible (lack of teacher understanding of new pedagogy, shortage of resources etc). It would seem, however, that at least some of the reasons for such patterns are to be found in the character of the formal examination associated with the course.

A brief summary of some of the evidence emerging from a detailed study of MIS does suggest strongly that the impact of a particular pattern of examining on its use in schools has been detrimental to the realisation of the course aims. Patterns of teaching, internal assessment procedures and students' perceptions of the nature of science education all appear to have been influenced adversely by aspects of the LCE/SRP. In principle, however, there seem no overriding reasons why changes in the LCE/SRP should not be capable of producing an examining pattern that reinforces rather than undermines important emphases of the curriculum. An analysis of examination performance of 744 LCE/SRP candidates suggests that differences between high and low achievers are not related closely to differential performance on higher cognitive level questions. The proportion of marks scored on different types of questions is quite similar between groups of pupils at each end of the ability spectrum. The inclusion of much greater

proportions of comprehension- and application-based questions in the examination would not therefore penalise poorer pupils disproportionately. It could have the positive effect of shifting the priorities of both teachers and pupils away from the acquisition of factual knowledge towards greater concern with the kinds of achievement that the MIS course seeks to promote.

Some Concluding Remarks

The main characteristics of the relationship between the MIS curriculum and the public selection examination associated with it are not specific to this course. Observers in many countries have noted similar linkages between the curriculum in action and patterns of assessment.[6] In this particular case it seems that there is ample evidence that both the form (objective multiple choice questions) and the content (particularly the bias towards questions answerable through recall alone) of examinations, have had adverse effects on teaching and learning. I have chosen to highlight some of these effects here in order to counteract the tendency to ignore or underrate the need to develop consonant and supporting systems of assessment and examination for curriculum renewal programmes. Where people go to school chiefly to be selected for more schooling, the form and content of the selection process define the curriculum in action far more effectively than exhortation, rhetoric or prescriptive curriculum materials.[7]

This is **not** to argue that teaching methodology, or course content is not important for the achievement of curricular objectives; obviously they are. It **is** to stress that the motives and meanings that pupils, parents and many teachers bring to the educational process in schools may not coincide with those of the professional educators who design and develop new programmes. The value of new content and changes in pedagogy are generally not self evident to such participants when they are associated with examinations and selection procedures which do not reflect the emphasis of the new curricula.

The 'restricted professional' and the 'instrumentally motivated' student are not so much aberrations to be eliminated from the implementation of the curriculum, as central actors whose characteristics must be accommodated in any proposal for curriculum renewal which seeks to have lasting impact. A cost-effective way of influencing the performance of such actors is to focus greater attention on ways in which examining procedures can be used to reinforce, rather than undermine, the achievement of curriculum objectives. Changes in the nature and content of assessment procedures and the quality of their interaction with teaching and learning are unlikely to prove as expensive and time consuming, as, say, redesigning an entire curriculum.

In conclusion, I will identify three general areas in which changes in patterns and procedures of examining have particularly powerful implications for effective curriculum renewal. These are:

1 developing techniques of assessment and examination which correspond systematically with the educational objectives of new curricula. Recall-dominated examining of curricula designed to encourage other types of cognitive and affective outcomes is clearly counterproductive. Investment in effective procedures and adequately trained staff obviates difficulties arising from the differing requirements of curricula and examinations;

2 close monitoring of the working of selection examinations and their effects on the curriculum in action.

Curriculum workers need to monitor the influence of selection examinations on curricula in order that appropriate action can be taken to ensure that such influence is benign. The form taken by programmes in support of a new curriculum (in-service courses, changes in initial training, resource provision etc) must take cognisance of changes in patterns of assessment if it is accepted that these play a central role in delineating the curriculum and motivating those who experience it. It is worth noting that evidence from several countries, including Malaysia, indicates that selection examinations can work to test the adequacy and understanding of **teachers** as much as provide reliable indicators of pupil potential.[8] Close monitoring could establish the extent to which this is true and whether action is desirable to diminish this effect;

3 detailed and explicit feedback of examination performance to teachers and pupils.

Communicating to a teacher that 20 per cent of his class failed with grade Es tells him nothing of the reasons for his and their failure. Indicating which questions and tasks pupils completed successfully and which they did not provides useful information on which to base future action. If pupils do behave according to what they perceive to be the demands of

[6] See for example, Little 1978, Dore 1976, UNESCO 1969.
[7] See especially Ruth Wong's paper in UNESCO 1969.
[8] See for example Somerset, H.C.A. 1974.

examinations, then feedback of this kind provides a potentially effective method of reducing misconceptions and using examination 'backwash' to support new curricula.

Taken together, concerted action on these aspects of examining does provide an attractive response to some of the problems of effective and enduring changes in the curriculum in action. Though not a panacea, such a tactical shift towards curriculum improvement through examination reform does provide genuine possibilities for effective action at relatively low cost and in a comparatively short time.

References

Bloom, B. S. et al, 1971, *Handbook on Formative and Summative Evaluation of Student Learning*, McGraw Hill

Dore, R. P., 1976, *The Diploma Disease*, Allen & Unwin

Little, A., 1978, 'Types of Achievement and Examinations', *IDS Research Reports* 4, IDS, Sussex

Mee, A. J., P. Boyd and D. Ritchie, 1971, *Science for the 70s*, Heinemann Educational Books

MIS, 1973, *Malaysian Integrated Science: Syllabus*, revised version, Ministry of Education, Kuala Lumpur

Scottish Education Department, 1969, 'Science for a General Education', *Curriculum Paper* 7, HMSO

Somerset, H. C. A., 1974, 'Who goes to secondary school?', in D. Court and D. P. Ghai, *Education and Social Department*, Institute of Development Studies, Nairobi

UNESCO, 1969, 'Examinations', in *World Year Book of Education*, Paris